

meridge Clay, or even Coral Rag, so stored with phosphoric acid that its denudation would furnish nothing but a magnificent crop of nodules of phosphate of lime, like these.

The wood which occurs in the bed is like that which occurs in the Gault of the southern counties and Carstone here, and is mineralized with phosphoric acid, and therefore no more requires an appeal to extensive denudation of Purbeck beds to account for it than the occurrence of remains of *Iguanodon* can be held to prove denudation of Wealden beds; for the chief fame of that beast is from its occurrence in the Shanklin Sands in the *Iguanodon* quarry.

Like the Cambridge Greensand, the deposit offers many new facts of interest in the distribution of life. Thus *Pliosaurus*, so characteristic of Oxford Clay, Coral Rag, Kimmeridge Clay (and probably Portland), is now found in the approximate equivalent of the Shanklin Sands. *Dinotossaurus*, a new genus of the Oxford and Kimmeridge Clays, also abounds here, and thus, like *Ichthyosaurus*, *Plesiosaurus*, *Megalosaurus*, &c., helps to connect into one great life-system the lower and the upper Secondary Rocks.

I am, Gentlemen,

Faithfully yours,

Sidney Sussex College, Cambridge.

July 17, 1866.

H. SEELEY.

XXI.—*Description of Calamoichthys, a new Genus of Ganoid Fish from Old Calabar, Western Africa.* By JOHN ALEXANDER SMITH, M.D., F.R.C.P.E.; with *Observations on the Internal Structure*, by R. H. TRAQUAIR, M.D., Demonstrator of Anatomy in the University of Edinburgh*.

IN the beginning of January 1865, the author received from the Rev. Alexander Robb, Old Calabar, a package of specimens of natural history preserved in spirits. Among these were two small ganoid fish. They were, however, imperfect, having been torn across near the anal region, and their caudal extremities were wanting. The characters of the fish could not, therefore, be completely determined. The author, however, exhibited them at a meeting of the Royal Physical Society, on the 22nd March, 1865, and stated that they were allied to the genus *Polypterus*; but from various differences in character, to be afterwards detailed, and especially the great relative length of their bodies, and the apparently total absence of ventral fins, he would place them in a new genus, which, from their general aspect and form,

* Communicated by Dr. Smith, from the Proceedings of the Royal Society of Edinburgh.

he designated *Erpetoichthys**, the reptile- or serpent-fish; and the species, from the locality where it was found, he named *E. calabaricus*.

Since that time the author had received perfect specimens from Old Calabar, and found that the accuracy of his previous conclusions were confirmed.

The fish is got in the freshwater streamlets which run into the main rivers or creeks of the great Calabar River, and in the pools of the marshy lands. It is occasionally sold in the markets, and eaten by some of the natives. Its native name is *U-nyāng*, which the Rev. Mr. Robb explains by suggesting that it may be derived from a verb signifying to struggle or scuffle for the possession of a thing, and he therefore supposes it to mean the struggler, or, using a Scottish word as more appropriate, the "wambler," the name being probably given to it on account of the apparent struggling, wriggling, or undulating movements of its elongated body as it swims in the water or mud of the river.

Summary of characters of the genus *Calamoichthys*, and its relation to the genus *Polypterus*:—

Genus *Calamoichthys*.—*Head* small, depressed above, somewhat oval in shape (rounded and narrow in front, expands laterally behind orbits, and contracts again at the back part, towards neck). Suboperculum wanting. (No small plates below preoperculum.) *Body* much elongated, anguiform (cylindrical for about half its length, then becoming gradually more compressed laterally, and tapering slightly towards its caudal extremity). *Caudal extremity* short, tapering rapidly. *Caudal fin* rounded, homocercal; fin-rays hard. (*Scales* osseous, rhombic, sculptured.) *Fins* small; pectorals obtusely lobate; fin-rays soft; dorsal finlets numerous, separate; anal (with fulcrum at base anteriorly) in male large, in female small; fin-rays hard; ventrals wanting.

The last character is rather an important one, as this fish thus appears to be the only living ganoid yet known which has no ventral fins. Van der Hoeven, in his 'Handbook of Zoology,' gives the presence of ventral fins as one of the characters of his great Section III. of the class Pisces, the *Ganolepidoti*; and older naturalists, as Cuvier, place the Ganoids, for a similar reason, among the *Malacopterygii abdominales*. The discovery of this fish will therefore necessitate a change in this character of the whole section.

* Since this paper was sent to press, the author has learned that a closely corresponding name to *Erpetoichthys* had been already used in ichthyology; and accordingly he now changes the designation to *Calamoichthys* (κάλαμος and ἰχθύς), which still bears a relation to the cylindrical shape of the fish.

In the genus *Polypterus*, on the other hand, the *head* is relatively larger (with apparently little or no lateral expansion and subsequent contraction towards the neck); its gently swelling outlines gradually expand and run backwards into those of the body. Suboperculum present; several small plates below preoperculum. *Body* relatively much shorter, generally tapering gradually from behind region of pectoral fins, and becoming more compressed laterally towards its caudal extremity. *Caudal extremity* longer. *Scales* generally smooth (?). *Fins* larger; pectorals, fin-rays osseous; anal apparently alike in size in male and female; ventrals present.

The genus *Calamoichthys* agrees, however, with *Polypterus* in the general character of its numerous dorsal finlets; lobate pectorals, two nasal cirri, a spiracle on each side of the head above, and a large flat branchiostegous ray, or jugular plate, on each side of the mesian line below; and also in the hard, osseous, rhomboidal-shaped ganoid scales, arranged in rows running obliquely backwards, and in the tapering caudal extremity of the body.

The new genus belongs, therefore, to the same family as *Polypterus*, and would accordingly fall to be placed next to it in the family of the Polypterini.

Family Polypterini.

I. Genus POLYPTERUS.

II. Genus CALAMOICHTHYS.

1. Species *C. calabaricus*.

(The specimens described measured from 8 to nearly 13 inches in length.)

Hab. Old Calabar River, and the Camaroons, West Africa.

(A female sent by Mr. G. W. Mylne from the latter locality, and recently received by Dr. Smith, was also exhibited.)

On dissecting those specimens of *Calamoichthys* entrusted to the author by Dr. Smith, the greatest similarity was found to exist between their internal organization and that of *Polypterus*, the chief differences being dependent on the great elongation of the body of the former fish, while the abdominal cavity extends proportionately still further back towards the caudal extremity than is the case even in the genus last mentioned.

The vertebræ resemble in construction exactly those of *Polypterus*, but are very much increased in number, amounting, in the specimen which was used for the preparation of the skeleton, to 110, the first of which has no body, consisting merely of neurapophyses, spinous process, and a pair of ribs. These latter form

the first of the series of well-developed upper ribs, which extend, in the horizontal intermuscular septum, as far back as the ninety-eighth vertebra. But ribs of the lower series are very deficient in development in comparison with those in *Polypterus*, where the whole series of abdominal vertebræ, except the first, is furnished with those appendages, which posteriorly attain a considerable length. In *Calamoichthys*, on the other hand, those lower ribs are very minute, and no trace of them was found in advance of the sixtieth vertebra. The number of abdominal vertebræ, in the specimen alluded to, is 100, of caudal 10—showing the very great proportional elongation of the abdominal and shortening of the caudal region. The vertebral column projects beyond the last caudal vertebra, as a notochordal continuation or “urostyle” concealed among the rays of the caudal fin. The bones supporting the fins agree in their general conformation with those in *Polypterus*, there being, however, a less ossified state of the radius, ulna, and carpus, while the pelvic bones, along with the ventral fins, are completely absent. The first dorsal finlet is placed opposite the forty-ninth vertebra.

As regards the form and arrangement of the bones of the cranium and face, the most complete correspondence is found with those of *Polypterus*, a space being found, however, below the preoperculum, which, in various species of *Polypterus*, is defended by a variable number of bony plates. The suboperculum is also completely absent. The arrangement of the mucus-canals on the head is similar to that in *Polypterus*.

The arrangement of the muscular system corresponds in the two genera. In *Calamoichthys*, owing to the great increase of the number of vertebræ, the number of transverse segments of the great body-muscle is also much larger. The muscular layer along the belly is very thin.

Viscera.—The œsophagus dilates into a flask-shaped stomach, which terminates behind in a *cul-de-sac*. From the interior part of the stomach, and close behind the entrance of the œsophagus, issues the intestine, which passing first slightly forwards, makes almost immediately a turn on itself, and then proceeds straight back to the anus. A small cæcal appendage, with the apex directed forwards, is seen in connexion with the intestine shortly after its backward flexure; and a little further down, between this and the anus, a spiral valve of about five turns is developed in the interior. The liver was in none of the specimens examined very voluminous, but much elongated, being continued as a narrow stripe the whole length of the abdominal cavity. The gall-bladder is distinct, and opens into the intestine immediately after its flexure, and in front of the cæcum.

The heart is conformed as in *Polypterus*, with muscular bulbus

arteriosus, which is furnished internally with numerous valves, of unequal size. The branchial artery gives off first a large lateral branch on each side, which divides into three for the three posterior gills; the trunk then bifurcates, giving off a branch for the anterior gill of each side. As in *Polypterus*, the posterior gill has only one row of leaflets, and the cleft behind it is wanting. No trace of a "pseudobranchia" was found, an organ likewise absent in *Polypterus*. The spleen is very long and slender, lying closely along the great air-bladder. The air-bladders are two in number, opening by a common orifice into the lower aspect of the throat, behind the gill-clefts. That of the left side is small, being only $2\frac{5}{8}$ inches in length in a fish of 10 inches; it is closely adherent to the side of the œsophagus and commencement of the stomach. That of the other side measures $8\frac{3}{4}$ inches in the same fish, and extends through the whole length of the abdominal cavity, lying closely along the under surface of the vertebral column.

Like the rest of the abdominal organs in general, the kidneys are very slender and elongated; each consists of a number of little lobules, which lie in the concavities on the under surfaces of the vertebral bodies. The excretory duct or ureter lies along the outer border of the organ, and passes straight backwards to unite with the genital duct, and, with its fellow of the opposite side, at the urogenital pore. The ovaries and oviducts correspond exactly with Müller's description of these organs in *Polypterus* (Trans. Berlin Acad. 1844). Each ovary is in the form of a flattened plate, suspended in front of the posterior part of the kidney by a mesentery, is solid, and consists of a stroma imbedding ova of all sizes, up to $\frac{1}{4}$ inch diameter. The oviduct, proceeding forwards from the urogenital pore as a pretty wide tube, crosses beneath the ovarian mesentery, and opens into the peritoneal cavity, on the outer side of the gland, and closely above its lower extremity. The ovaries are not symmetrical in position, one being in advance of the other, so that also one oviduct is longer. In a female measuring $8\frac{5}{8}$ inches the right ovary was $1\frac{1}{2}$ inch in length, its anterior extremity being placed $4\frac{3}{8}$ inches from the top of the snout, and the length of the oviduct $1\frac{7}{8}$ inch, while the left measured $1\frac{5}{8}$ inch, was situated at its anterior extremity $5\frac{3}{8}$ inches from the tip of the snout, and had a duct of $1\frac{3}{16}$ inch. The testes are very minute, and situated very far forwards, each being a small oval body $\frac{3}{16}$ inch in length in a male of 10 inches; and in the same specimen the right one was situated $2\frac{1}{2}$, and the left $2\frac{1}{16}$ inches back from the tip of the snout. A very minute duct runs backwards parallel with and close to the ureter, which it joins near the urogenital pore.

On opening a number of specimens, it was found that all those with a large anal fin were males, while those in which that organ was small were females. The females are, however, to be distinguished from the males by another character, namely the much larger size of the urogenital pore, which is situated immediately behind the anus.

XXII.—*On the Amylaceous Globules of the Florideæ and Corallineæ.* By M. VAN TIEGHEM*.

KÜTZING first indicated† the existence in the cells of certain Florideæ of amyloid grains, sometimes endowed with a concentric structure; but in assimilating them to the protoplasmic globules of the green and olive Algæ, in including under the general name of *cellular globules* or *gonidia* the whole of the intracellular formations of the Algæ, however dissimilar they may be, and in ascribing to them, as is implied by this name, a reproductive faculty, the illustrious algologist seems to me to have misunderstood their nature and function. M. Nägeli, also, in his great work on starch-grains‡, hesitates to pronounce an opinion as to the existence of starch in the Florideæ. His own observations, indeed, showed him, in *Cystoclonium purpurascens*, Kütz., some globules to which iodine communicates a coloration varying from red to brown and violet; but he took them for slightly amylaceous parietal grains of protoplasm, and he remained so uncertain upon this point as to declare, in another part of his memoir (p. 382), that starch-grains are wanting in the Florideæ, and finally to leave to future investigations the care of deciding whether these Algæ do possess starch, and of what kind it is. It is this point that I have undertaken to clear up by a series of observations, of which I have the honour to present the Academy with the first results.

For the sake of clearness I shall take as an example *Halopithys pinastroides*, Kütz., which is found in abundance on our coasts. In the cylindrical and much branched frond of this Floridean, the thickened joints of the axis contain only a finely granular liquid; the joints of the five siphons, on the contrary, and the cortical cells are filled with transparent globules, which are colourless in the interior tissue and of a rosy tint in the peripheral zone, although readily deprived of their colour by alcohol; these are scattered in the liquid which bathes the sections, forming therein white streaks. Their most general

* Translated from the *Comptes Rendus*, Nov. 6, 1865, pp. 804-807.

† *Phycologia generalis*, p. 40.

‡ *Pflanzenphysiologische Untersuchungen: Die Stärke-Körner*, 1858.